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# Pastures and landscape conservation

Beef cattle ranching in the Pantanal



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WWF-Brazil

Embrapa Pantanal

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### WWF-Brazil

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### Embrapa Pantanal

Embrapa Pantanal is one of the 47 units of Embrapa (Portuguese acronym for *Empresa Brasileira de Pesquisa Agropecuária*), the Brazilian Agriculture Research Agency, which is linked to the Federal Ministry of Agriculture, Cattle Breeding and Food Supply. Embrapa Pantanal was created in 1975, as a small research unit to meet the demands from the extensive cattle ranching in the Pantanal region. In 1984, after identifying the region's social, economic and environmental complexity, the organization expanded its mission and research approaches. Embrapa Pantanal technical staff is presently composed of over 134 employees, including researchers, analysts and research support assistants.

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Beef cattle ranching  
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By WWF-Brazil

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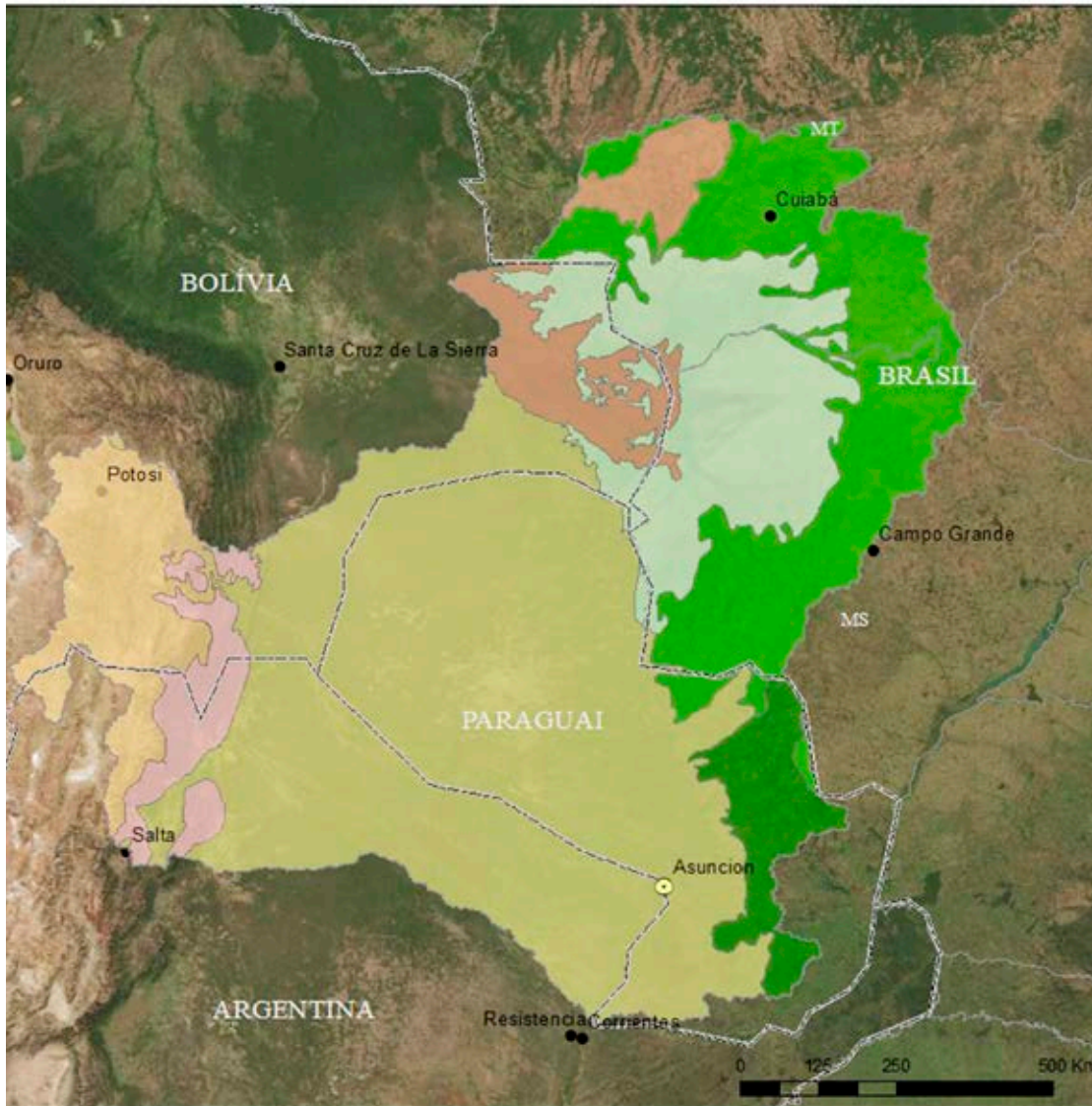
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### Ecoregions

- Chaco
- Cerrado
- Pantanal
- Atlantic Forest
- Chiquitana Forest
- Andean Yungas
- Andean ecosystems



The Pantanal is located within the Paraguay River Basin, encompassing Brazil, Bolivia, Paraguay and Argentina. Map: WWF-Brazil

# 1

## Introduction: pasture and landscape conservation

Studies made by the Brazilian federal government and NGOs – such as WWF-Brazil, Ecoa (*Ecologia e Ação*), Conservation International, Avina Foundation and SOS Pantanal --, with technical support from Embrapa Pantanal, show that Pantanal is the best conserved ecosystem in Brazil, with nearly 87% of its native vegetation still intact. It is also the largest continental floodplain on Earth, and shelters a great many animals and plants, besides featuring unique landscapes.

In such an environment, regional characteristics, particularly the upward and downward movement of the waters, has been modeling cattle ranching for over 300 years now. The first official record for cattle breeding in the area dates from 1737. Today, 95% of the Pantanal lands are private properties, and eight out of ten hectares are used for breeding beef cattle.

Without a doubt, the conservation of those landscapes depends on the natural

resources adequate management by the Pantanal cowboy, the so called '*homem pantaneiro*' (Pantanal man).

In other words, the extensive cattle ranching model has reached a balance between cattle and nature.

Nevertheless, this balance is threatened by human activities. Deforestation and the inadequate land management for agriculture and ranching are some of the main threats to the Paraguay River Basin (see map on previous page), particularly in the higher part of the Basin. As a result, there is erosion, siltation of rivers, and floods in areas which were previously not flooded. Over 8 million people are now dwelling within this hydrographic basin, which also features 30 million cattle heads and nearly 7 million hectares of plantations.

Another important point to keep the balance is the correct management of pastures and herds. Native rangelands are the Pantanal

chief natural resource, and they can be found in practically every landscape. Native rangelands provide feed for the cattle and wildlife, besides playing an important environmental role: they protect the soil, ensure nutrient cycling, provide a freshwater reservoir, and so on and so forth. Embrapa data reveal that there are 1,863 plant species in the Pantanal.

Grown pastures also require efficient management and use. This means adjusting the cattle stocking rate in order to avoid overgrazing, excessive trampling and pasture degradation, to ensure good vegetation cover and protect soil fertility.

Moreover, pasture formation in the Pantanal must be done mainly in areas which are already deforested or degraded, for this means lower financial cost and a lower ecological impact. The major goal of pasture formation in the plain should be to reinforce the herd feed. Total replacement of native rangelands by grown pastures is not recommended. The recommendation is to replace part of the native rangelands which occupy the areas which are not having much use for cattle feed.

One of the main problems faced by rural producers in the Pantanal is degradation of both native and exotic pastures by invasive species, which decrease the pasture support capacity.

Invasive species are often established due to inadequate management of pastures (through mowing, cutting, and so forth) and of herds (excessive or low live stocking rate). This stresses the relevance of good management practices to maintain the balance between livestock production and ecosystem conservation.

Moreover, the voluntary implementation of good practices by Pantanal ranchers may encourage the use of instruments already in use in other parts of the country, such as the payment for environmental services, which increases the activity productivity and profit while having less negative impacts upon nature.

Therefore, the good practices which are recommended in this booklet are presented in the spirit of increasing beef cattle ranching sustainability in the Pantanal and ensuring cattle ranchers' profit, while conserving the natural wealth which sustains the economic activities in this important Brazilian ecosystem.





# 2

## Soil use and conservation

*Evaldo Luis Cardoso and Sandra Aparecida Santos, researchers at Embrapa Pantanal*

Soil is a natural resource and its conservation depends on management techniques which are adequate to its suitability and can ensure the quality and maintenance of its physical, chemical and biological features.

Unlike most Brazilian soils, in the Pantanal the main soil use is restricted to native vegetation for extensive beef cattle ranching. The vegetation basically consists of extensive native rangelands and tree formations, such as forest, tropical savannah (*cerrado*), savannah forest (*cerradão*), rangeland fields (*campo cerrado*), and rangelands with shrubs (*campo sujo*), among several others.

In those native environments, the vegetation cover is harmoniously integrated with the soil, due to essential processes of nutrients cycling and organic matter accumulation and

decomposition, and this ensures good soil and ecosystem conservation.

Soil conservation in the Pantanal plains is directly linked to native vegetation adequate management. Contrary to what happens in conventional agriculture, native rangelands are not impacted by intense upturning of the soil which increases the chances of erosion and favors organic matter decomposition.

Therefore, good soil conservation practices mean avoiding overgrazing by the adoption of an adequate livestock stocking rate for the various types of pastures, as well as keeping a soil seedbank, together with restricting grazing in native rangelands order to ensure the flowering and seed production. When fire use is inevitable, it requires a license from the authority and strict compliance with required criteria for fire control.

Special attention must be paid to the correct management of grown pastures to re-

place part of the low quality native vegetation (see chapter 3). This also requires a license from public authorities and must aim at maintaining satisfactory amounts of organic matter in the soil.

Considering that soil liming and fertilization are not used in the Pantanal, mostly due to the predominance of sandy soil, the rational management of native rangelands

and grown pastures becomes even more important.

Inadequate management may contribute to deplete the soil organic matter and fertility. This depletion may compromise the ecosystems recovery and decrease the production capacity, the supply of environmental services – such as water retention – and the very cattle ranching sustainability.



High livestock stocking promote rangeland and soil degradation.



Inadequate management compromises the grown pastures productivity and may cause soil degradation.



Well managed pastures, as for instance the field with a predominance of Mimosa grass, allows the grass flowering, promotes soil conservation and favors good pasture productivity.

# 3

## Native rangelands conservation and management

*Sandra Aparecida Santos, Sandra Mara Araújo Crispim, José Comastri Filho, and Evaldo Luís Cardoso, researchers at Embrapa Pantanal*

Native rangelands are the basic feed for herds in the Pantanal. Together with forest areas, rangelands have great ecological relevance, protecting soils and providing essential environmental services, such as carbon storage and water supply. Rangelands also provide feed for the deer, capybara, and other large herbivores.

The main challenge faced by technical staff and decision makers has to do with the management and monitoring of native rangelands, since their characteristics vary from one region to another and from one year to another. Rangelands sustainable management should take into consideration the type of grass to be used for pasture, its availability and quality.

This will depend on the grazing system (whether it is continuous, rotational, or restricted grazing), on the feed supplement (whether it is protein, energy, or mineral), and on the invasive species control strategies.

Rangelands may be classed according to the landscape, vegetation formation, dominant plant, and the key grass fodder in cattle diet. The dominant species is also the most abundant one in a certain region, while the key fodder is the preferred grass for beef cattle.

Landscapes vary among forests, savannas, and fields; they may be usually dry, flooded or moist. The main feeding areas for the cattle are those in the open fields (referred to as 'clean'), dense savannah fields, bay edges, and lowlands.

Few native grass species are considered to be a key fodder; nevertheless, a greater effort is due for their maintenance, since

besides enriching the animal feed, they are relevant for biodiversity conservation.

Therefore, the increased supply of key species in the grazing areas should be the main goal of rangeland management in the Pantanal. The better quality grass species are found in the flooded areas, requiring management to adapt to the high and low pulses of freshwater. Pantanal biodiversity conservation basically depends on keeping its landscape mosaic, which is composed of several native fodder grasses.

Pantanal native rangelands sustainability occurs when the floristic diversity and recovery capacity are maintained through time, even in the face of natural disorder or turmoil caused by mankind.

On the other hand, the intensity and frequency of droughts, forest fires, floods, and inadequate livestock stocking rate may alter the ecosystems and produce a favorable environment for the dissemination of invasive plants.

And that is one of the main problems faced by rural producers in the Pantanal.

The native and exotic rangelands support capacity is decreased due to the invasion of shrubs, trees, and herbs – such as ‘canji-queira’ (*Byrsonima orbignyana*), ‘assa-peixe’ (*Vernonia Polysphaera*), ‘cambará’ (*Vochysia divergens*), the sandpaper tree or ‘lixeira’ (*Curatella americana*), ‘malva-branca’ (*Walteria albicans*), ‘araxicum’ (*Annona coriacea*), ‘guanxuma’ (*Sida spp*), and ‘pombeiro’ (*Combretum spp*).

In areas with more fertile and clayey soils, such as in Miranda and Nabile regions, one of the most aggressive invasive species is ‘aromita’ (*Acacia farnesiana*), which is largely found alongside highways and other areas which have been altered by human activity. To clean grasslands in the Pantanal it is necessary to have a license from the competent authority.

Invasive species (native or exotic ones) spread out in places where they do not naturally occur and are harmful for the ecosystem and rural production. The predominance of such species depends on soil and climate conditions, as well as on human actions,

such as management and control. Inadequate livestock stocking rate and management may favor the invasive plant dissemination.

In the Pantanal, the progress or retreat of many species follow the flood and drought cycles; this can either promote grassland clearing, or allow for higher or lower degree of infestation in the fields. In a sequence of very dry years, several trees move on to lower regions – this is the case of ‘lixeira’ (*Curatella americana*), ‘maminha’ (*Zanthoxylum rigidum*) and ‘canjiqueira’ (*Byrsonima orbignyana*). With the exception of canjiqueira, which does not tolerate floods, the other species retreat when the water is back. Therefore, their control is desired, as their high density in sandy fields decreases the occurrence of fodder plants and renders cattle management more difficult.

When natural recovery is still possible, the recovery capacity of rangeland ecosystems depends on the invasive plant density or coverage levels. Otherwise, recovery may

become unfeasible due to the high costs of manual and mechanic controls.

Due to Pantanal landscape complexity, it is important to stress that there are no single rules for managing and controlling the various invasive species. In order to ensure an effective control, it is necessary to be aware of each native species’ invasion threshold (its density) in the various phytophysiognomies or landscapes.

In the case of an invasion by ‘canjiqueira’ (*Byrsonima orbignyana*) on an open field, this species must be removed when the plant density exceeds approximately 600 specimens by hectares. In flooded areas, the plant should be cut at the trunk base and this must be done before the flood. In other places, a tooth blade can be used to extract the whole plant, and the remains should not be left in piles on the pasture.

Annex 1 presents a table of the main grass species in the Pantanal, as well as tips for controlling the invasive species. It may be accessed at [wwf.org.br/cartilha\\_pantanal](http://wwf.org.br/cartilha_pantanal)

## USUALLY DRY LANDSCAPE



Phytophysiology: Clean field in sandy Pantanal. Dominant and key species: grama-do-cerrado (*Mesosetum chaseae*).



Phytophysiology: Savanna. Dominant species : lixeira / fura-buxo. Key species: *Gymnopogon sp.*

## SEASONALLY FLOODED LANDSCAPE



Phytophysiology: lowland in sandy Pantanal. Key and dominant species: capim-mimosinho (*Reimarochloa spp.*).

## USUALLY HUMID LANDSCAPE



Phytophysiology: Inland and bay edge. Dominant species: camalote (*Pontederia cordata*). Key species: capim-de-capivara (*Hymenachne amplexicaulis*) and capim-arroz (*Luziola subintegra*).

# 4

## Grown pastures management and formation

*José Anibal Comastri Filho and Sandra Mara Araújo Crispim, researchers at Embrapa Pantanal*

The purpose of grown pasture formation and management in sandy Pantanal areas, such as Nhecolândia and Paiaguás, is to increase the animal feed availability. In practice, a joint management of grown pastures and native rangelands is necessary in order to ensure the required quantity and quality of fodder throughout the year. This measure should meet the needs of beef cattle development and raise herd productivity, thus decreasing production costs.

It is important to point out that pasture formation in the Pantanal does not, whatsoever, mean to completely replace native grass by grown species, but rather to replace part of the coarse grass occupying areas which are little used by herds.

Good practices for grown pastures formation and management include the following: choosing areas with savannah fields (*campo-cerrado*) with low quality grass species; analyze soils to determine its soaking degree and time; harrow and plow twice the land (once at the peak of the drought and a second time just before sowing); use technical assistance to identify the best seed and grass species for that plantation; sow in an adequate way and at the beginning of the rain season; only allow animals to enter the formed area after 90-120 days; determine the ideal livestock stocking rate for the pasture, based on the amount of grass, among other considerations.

Those techniques ensure cheaper pasture formation and less environmental impact. They are an option for periods when feed



availability is critical, particularly during flood. They also prepare for calf weaning, decrease the break between births, and support the recovery of riding bulls and of the cows after lactation. Furthermore, they prepare for the reproducing period of heifers used to recompose the herd.

Embrapa Pantanal recommends, for instance, to grow pasture in sandy wetlands, with 30-50% in areas of dense field (*campo-cerrado*) with a predominance of coarse grasses – such as ‘carona’ (*Elyonurus muticus*), ‘vermelho’ (*Andropogon glaucescens*), ‘rabo-de-burro’ (*Andropogon bicornis*), and ‘fura-bucho’ (*Paspalum sp.*); and in the areas of sparse savannah (*cerrado ralo*), where there is a predominance of species such as ‘guaranazinho’ (*Copaifera martii*), ‘cajuzinho’ (*Anacardium humile*), and ‘pata-de-vaca’ (*Bauhinia forficata*).

In order to increase the fodder supply for the animals in those environments, the recommendation is to form grown pastures with

the following *Brachiaria* species: *Urocloa humidicola* or *U. dictyoneura*, mixing with 50% of *U. brizantha* or *U. decumbens*. This mix quickly provides good soil cover, preparing for the entrance of animals upon the pasture.

In any Pantanal property, pasture formation depends on social, economic, and environmental impact studies. In order to contemplate those necessary conditions while ensuring sustainable economic return (rentability), it is necessary to adjust the amount of animals according to the pasture support capacity.

For instance, in areas which are subject to great flooding, the livestock stocking rate should be 0.5 animal per hectare. In areas where flooding is scarce, stocking may reach 0.8 per hectare.

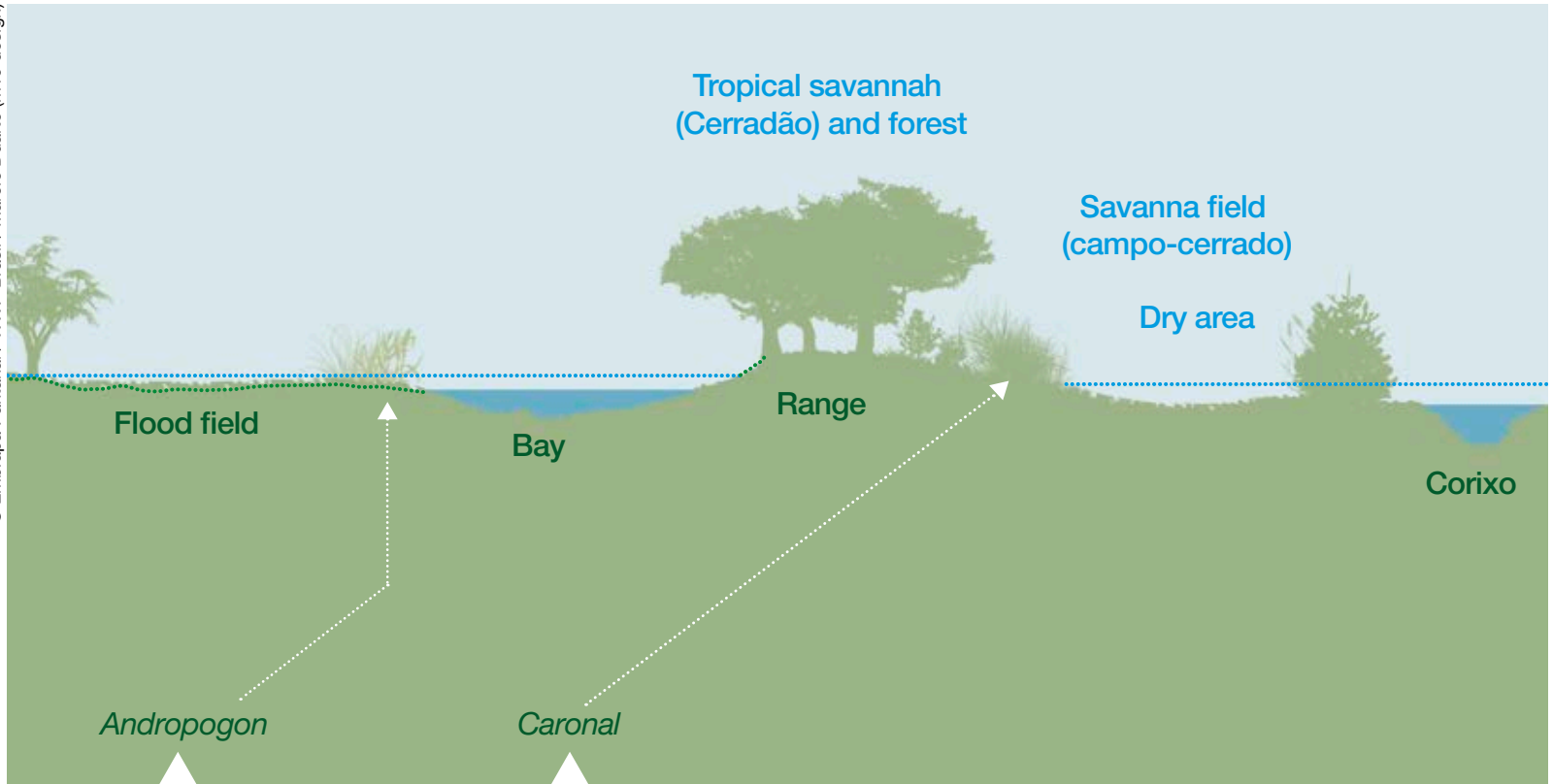
In livestock stocking calculation, it is necessary to take into account the mosaic composed of native rangelands and grown pastures, and their quality, which depends on factors like the land altitude and the soil

humidity. The fact that vegetation variety is also a source of feed for wildlife must not be overlooked.

In the past 30 years, due to the low availability and quality of native rangelands in some areas, farmers are introducing exotic grass species in some Pantanal regions. This means that native rangeland deficiency

may be overcome with well managed grown pastures.

This fact is encouraged by well marked dry periods (from July to September), when the intake of native grass decreases due to the grass aging; and in the rain periods (from December to April), when there is a decrease in grazing areas.



Phytophysiognomies preferably fit for the introduction of pastures in the Pantanal: flood fields with *andropogon* and dense fields with *caronal*. Source: Embrapa Pantanal.

# 5

## Grazing system productive features

*Urbano Gomes Pinto de Abreu,  
researcher at Embrapa Pantanal*

Breeding and re-breeding beef cattle on native rangelands are the main economic activities in the Pantanal. The herd in Pantanal is estimated as 4 million cattle heads and it is distributed in large properties. Looking at the historical human and economic occupation in the Pantanal, the conclusion is that beef cattle ranching helped conservation in that region. Therefore, the Pantanal conservation target includes strengthening sustainable practices for beef cattle breeding.

Beef cattle feed is almost exclusively based on native grass, such as ‘capim mimoso’ (*Axonopus purpusii*), ‘grama do cerrado’ (*Mesosetum chaseae*), and ‘grama do carandazal’ (*Panicum laxum*). In the flood season, the animals are taken to the higher areas,

and an integrated management is performed, including the Cerraldo plateau surrounding the Pantanal.

Therefore, there are two critical periods in cattle feeding: one is at the end of the flood season (February to May) and the other one is in the middle to late dry season (August and September).

The support capacity of the cattle’s preferred pastures varies through the months and the years and depends mostly on the rain distribution and the flood intensity and duration. In general, regarding the dry matter availability, the support capacity in those areas has decreased in August and September and also during the flood season. Regarding the quality (protein), the support capacity has decreased in April-June.

The assessment of native grass support capacity by farmers in the Pantanal is a

subjective one. In farms with an area of over 4,000 hectares, the livestock stocking rate is 3.4 to 4.2 hectares per head, whereas in the farms up to 2,000 hectares the rate is around 2.5 hectares per head.

The overall rate was estimated at approximately one animal (a cow with a calf) per 3.6 hectares in the central part of the Pantanal, and 5 hectares in the eastern part of the region, where the quality of soils and grasslands is poorer.

Herd production rates are low in the region, and birth and weaning rates are around 45-60% and 35-50%, respectively.

Such performance is linked to the irregular supply of native grass, which does not provide sufficient fodder for the breeding herd. That is why it is recommended to use grown pastures for the female breeding cattle, in the first or secondary pregnancy, as well as for the young bulls which will be used for riding, and for the bulls which are put to rest (time out from sex).

Embrapa Pantanal assessed the birth rates, weaning, and other production indicators, as well as cash flows. Those assessments were used to evaluate the economic revenue from this modified production system, during the good practices implementation process.

In a property located in Paiaguás region, where 1,973 matrix animals were monitored, with no calf replacement taking place during the monitoring, one of the main results was that 17% of the cows were deemed to be unproductive. In spite of a decrease in the number of breeding cows (from 1,973 to 1,535 matrix animals), four years later the number of weaned calves increased from 525 to 857 animals.

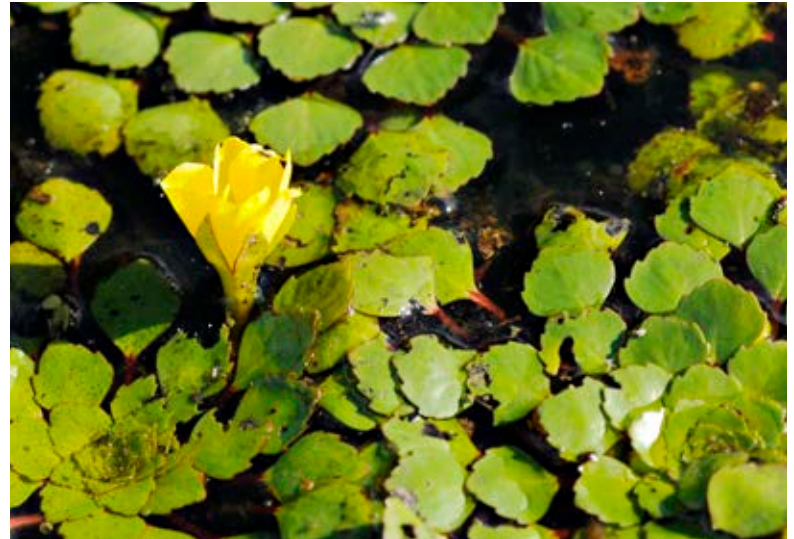
This shows that the technical discard has not caused a decrease in calf production, since the matrix cows were actually unproductive. The weaning rate was increased by the adoption of technologies providing the matrix animals with a higher chance of reconception.

The economic data analysis showed that the greatest cost of new technology stems from the use of mineral salt (75%), and the cost for differentiated management for cows and bulls accounts for 9 and 10%, respectively. See Annex 4 for the main results at [wwf.org.br/cartilha\\_pantanal](http://wwf.org.br/cartilha_pantanal)

It is important to point out that when new technologies are introduced, the response obtained in the production indicators occurs in the short run, while the economic results only occur in a longer term. Furthermore, in order for the system to be economically viable, it is necessary to continuously increase the production system efficiency.



Extensive breeding and rebreeding of beef cattle upon native rangelands are the main economic activities in the Pantanal.



Pantanal conservation includes the strengthening of sustainable practices for beef cattle ranching.

# 6

## Rural property sustainable management

*André Steffens Moraes, researcher at Embrapa Pantanal*

In the Pantanal, extensive ranching of beef cattle is developed in harmony with nature conservation. In other regions of the country, however, the breeding of beef cattle is generally seen as an activity having great negative environmental impact. Due to these and other factors, society is pushing the rural sector and calling for production with environmental responsibility.

There are several tools available to measure agriculture and cattle ranching negative impacts, such as the carbon footprint and the ecological efficiency. Some of them have even been incorporated in global trade and become non-commercial barriers.

Nevertheless, the rural producer can convert those market obligations into profit

opportunities. First of all, there are technologies, practices and simple processes providing an increase in productivity with minimum environmental damage. The investment in rangeland and pasture recovery and in the adoption of best management practices are good examples of that.

It is also possible to implement an environmental management system in the property. The farmer can count on producer associations and rural organizations to help him identify the environmental problems linked to cattle ranching, as well as the solutions and cost reduction strategies. Such management systems can facilitate obtaining certificates of agribusiness sustainability.

Cattle ranchers may also be financially compensated through the payment for environment services and the voluntary adoption of practices, such as maintaining the Panta-



nal native vegetation and biodiversity.

The payment for environmental services is an economic instrument which is now a highlight in conservation public policy, due to its potential for introducing changes in the traditional practices of land use. In the

Pantanal, there are great possibilities for this tool among cattle ranchers who are

interested in obtaining an additional source of revenue through the implementation of sustainable practices in their farms.

The payment for environmental services already appears in the legislation of eight Brazilian states; and since 2007 there are several projects-of-law in this theme channeling through the Federal Congress.



The sustainability tripod takes into account the interactions among the economic (the cattle), environmental (the forest, the animals and the freshwater), and social (mankind) aspects.

# 7

## Summary of good practices

### Native rangelands and grown pastures

#### Soil use and conservation

- Use the soil according to its aptitude, complying with legislation, and avoiding indiscriminate deforestation.
- Adjust the livestock stocking rate based on the fodder availability, ensuring good vegetation cover, and avoiding overgrazing, excessive trampling, pasture and soil degradation.
- Livestock stocking rates on the pasture may vary from one year to another, due to negative climate conditions, such as long periods of drought or flood.
- Comply with the law and follow technical recommendations for the use of controlled fire.
- Pay attention to maintaining the needed organic matter in the soil, particularly in grown pastures.

- In order to avoid pasture degradation, do not lower plants down to the soil level.
- In grown pastures in areas with high flood rate, the livestock stocking rate should be 0.5 animal (breeding cows) per hectare (see chapter 4).
- In grown pastures in areas with low flood rate, the livestock stocking rate may go up to 0.8 animals (breeding cow) per hectare (see chapter 4).
- In native pastures (rangeland), livestock stocking rate should be adequate to the pasture type and condition (see chapter 5).

### Grown pastures

#### Choosing the area

- Prefer savannah field (*campo-cerrado*) areas, having low quality, coarse grasses

### Soil analysis

- Perform physical and chemical analyses of the soils.
- Determine the area's flood degree and duration.
- Harrowing and plowing should be done twice: once at the peak of the drought, after the lowering of native vegetation; and a second time just before sowing.

### Fodder identification

- Fodder from *Urocloa* /*Brachiaria* genus is the most suitable one for planting in Nhecolândia and Paiguás sandy soils. The highlights are: *Humidicola*, *dictyoneura*, *decumbens* and *brizantha* species.
- In areas where the soil presents a medium or high humidity degree, only *humidicola* should be used.
- In sandy and slightly moist soils, *humidicola* or *dictyoneura* should be grown, mixed with *decumbens* or *brizantha*.

### Seed choice and sowing

- Always use good quality seeds from good origin. Their planting value should be equal or above 40%.
- Sowing should be done in the beginning of the rain season (October-March), in order to ensure good sprouting and establishing of the pasture.
- In lower areas, where flooding occurs, sowing should be done following the first rainfall.
- Seeds should be planted 4 centimeters down into the soil. The ideal depth is 2 centimeters.
- When sowing at the soil level, use a compactor roller.

### Preliminary management

- Only after 90 to 120 days should animals be allowed in the pasture formation.
- During this phase, avoid intense grazing in order to ensure good tiller and flourishing, high seed productivity and good soil cover.





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